TABLE 2.10
FORECAST OF BASED AIRCRAFT FLEET MIX
Key West International Airport
Master Plan Update

Year	Single Engine	Multi-Engine	TurboProp	Jet	Rotor	Total
2001	33	16	5	1	1	56
2006	35	17	5	1	1	59
2011	36	17	5	1	1	61
2016	38	18	6	1	1	64
2021	39	19	6	1	1	67

Source: URS, 2002.

2.6.3.3 General Aviation Operations

Itinerant general aviation operations are projected to increase at an annual rate of no more than 1.5 percent. This rate of growth is in line with the FAA's projected growth rate of hours flown. While hours flown is not the same as aircraft operations, it can be used as a gauge for overall activity levels.

With this rate of growth, itinerant general aviation operations would reach 45,000 annual operations (a level of operations last attained in 1997) again in the year 2011. By the end of the forecast period in 2016 itinerant general aviation operations would reach 52,000.

A forecast of local operations was made by examining recent activity and gradually increasing operations throughout the forecast period. Historically, local operations have been in the range of 20,000 although this level dropped precipitously in recent years, dropping to 12,000 in 2000 and 10,000 in 2001. While the events of September 11, 2001 had a significant affect on local operations during 2001 and likely accounts for the lower number of local operations recorded that year, it is obvious that the number of local operations were significantly lower during 2000. Thus, the forecast begins by rounding up the number of local operations recorded in the year 2000 and grows the activity by few thousand up to a level of 16,000 by the end of the study period. This forecast is presented in Table 2.11.

TABLE 2.11
FORECAST OF GENERAL AVIATION OPERATIONS
Key West International Airport
Master Plan Update

Year	Itinerant Operations	Local Operations	Total GA Operations
2001	35,692	10,948	46,640
2006	42,257	14,000	56,257
2011	45,523	15,000	60,523
2016	49,041	16,000	65,041
2021	52,831	16,000	68,831

Source: URS, 2002.

2.6.4 MILITARY OPERATIONS

Military operations at EYW are very difficult to track. A review of recent historical counts for local and itinerant operations have varied dramatically from one year to another, as indicated in Table 2.4. Consultation with air traffic control personnel at EYW revealed that part of the reason for the changes in traffic counts was due to what ATC personnel were recording as "operations." Apparently military aircraft transiting through EYW airspace, but never landing or taking off from EYW, were recorded as itinerant operations for a number of years. This seems to account for the large increase of itinerant military operations that were recorded during 1996 through 1999. Recent counts of itinerant military operations recorded activity levels that were generally in agreement with those recorded during earlier years. On the other hand, the number of local military operations jumped from just over 3,000 during 2000 to just over 11,000 during 2001. Part of this increase may have been related to increased military activity associated with military actions following September 11, 2001.

Since the level of military aircraft operations is not related to market forces, but rather operational and situational requirements of the military. It was deemed appropriate to select an activity level that is representative of recent historical levels, but that accounted for any known changes in the manner military operations are counted. Consequently, an annual level of 2,000 itinerant operations and 4,000 local operations was selected for military activity for the remainder of the study period.

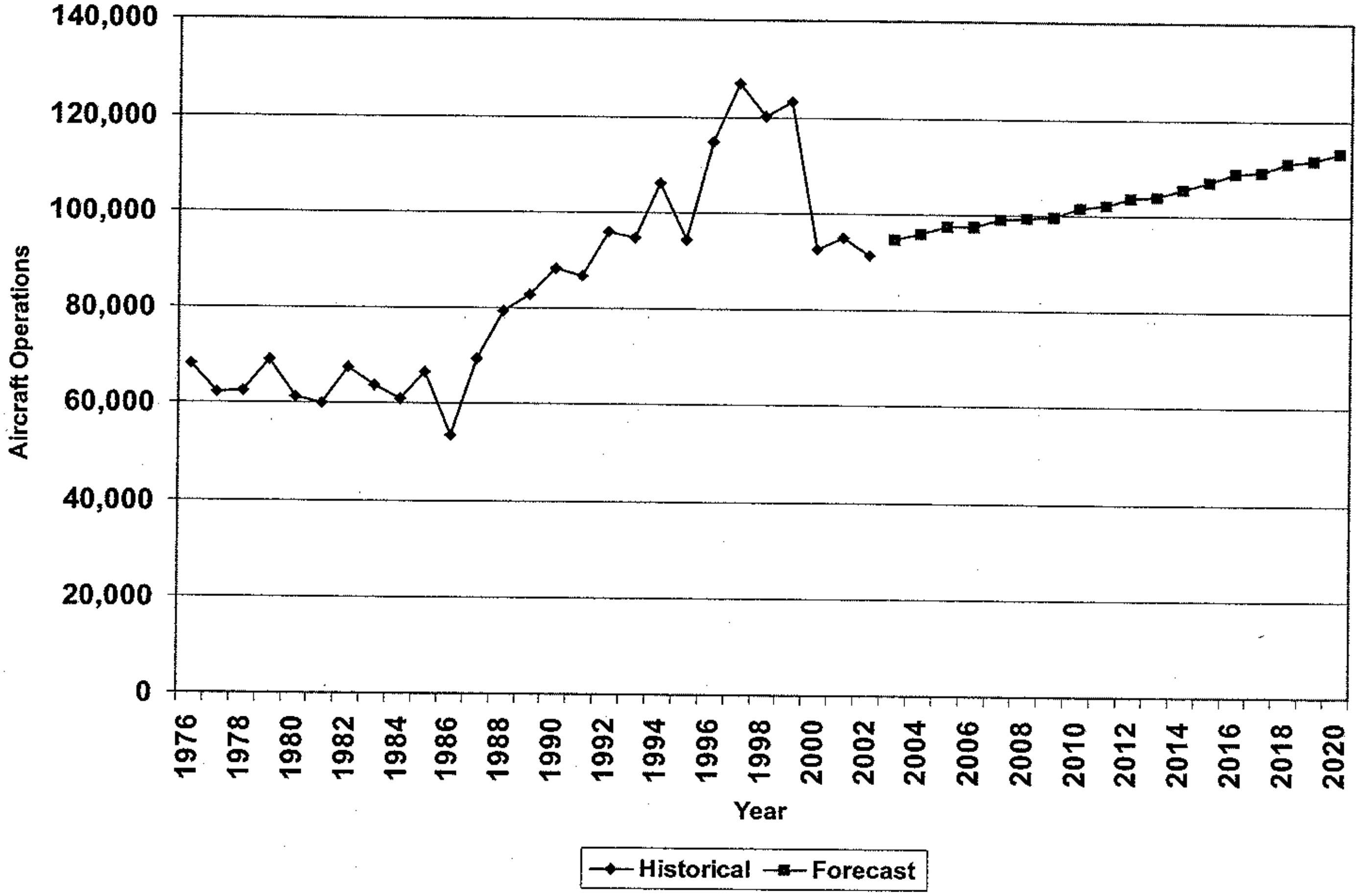
2.6.5 TOTAL AIRCRAFT OPERATIONS

The resulting forecast of total aircraft operations including commuter, general aviation and military activity is presented in Table 2.12 and Figure 2.13.

2.7 PEAKING CHARACTERISTICS

Information concerning the peaking characteristics of passenger enplanemnets and aircraft operations is required to properly ascertain the demand for various airport facilities. This information will be used in the demand/capacity analysis presented in the next section. The following definitions were observed in determining and presenting peaking information:

- Peak Month – The month when the greatest number of passenger enplanements or aircraft operations occur.
- Average Day, Peak Month (ADPM) – The average day during the peak month (i.e., the monthly value divided by 30 days).
- Peak Hour – The peak hour during the average day of the peak month.



Key West International Airport

Master Plan Update

FORECAST OF TOTAL AIRCRAFT OPERATIONS

FIGURE: 2.13

GRAPHICS\KEYWEST\MPUPDATE2001_FIG-2-13.AI

TABLE 2.12
FORECAST OF TOTAL AIRCRAFT OPERATIONS
Key West International Airport
Master Plan Update

Year	Itinerant Commuter	Itinerant GA	Itinerant Military	Total Itinerant	Local GA	Local Military	Total Local	Total
2001	36,241	35,692	887	72,820	10,948	11,270	22,218	95,038
2002	31,299	39,814	2,000	73,113	13,000	4,000	17,000	90,113
2003	35,406	40,411	2,000	77,817	13,000	4,000	17,000	94,817
2004	34,947	41,017	2,000	77,964	14,000	4,000	18,000	95,964
2005	35,821	41,633	2,000	79,453	14,000	4,000	18,000	97,453
2006	**35,405**	**42,257**	**2,000**	**79,662**	**14,000**	**4,000**	**18,000**	**97,662**
2007	36,290	42,891	2,000	81,181	14,000	4,000	18,000	99,181
2008	35,915	43,534	2,000	81,449	14,000	4,000	18,000	99,449
2009	35,585	44,187	2,000	81,773	14,000	4,000	18,000	99,773
2010	35,896	44,850	2,000	82,746	15,000	4,000	19,000	101,746
2011	**35,607**	**45,523**	**2,000**	**83,129**	**15,000**	**4,000**	**19,000**	**102,129**
2012	36,497	46,206	2,000	84,702	15,000	4,000	19,000	103,702
2013	36,240	46,899	2,000	85,139	15,000	4,000	19,000	104,139
2014	37,146	47,602	2,000	86,748	15,000	4,000	19,000	105,748
2015	36,921	48,316	2,000	87,237	16,000	4,000	20,000	107,237
2016	**37,844**	**49,041**	**2,000**	**88,885**	**16,000**	**4,000**	**20,000**	**108,885**
2017	37,649	49,777	2,000	89,426	16,000	4,000	20,000	109,426
2018	38,590	50,523	2,000	91,114	16,000	4,000	20,000	111,114
2019	38,425	51,281	2,000	91,706	16,000	4,000	20,000	111,706
2020	39,386	52,050	2,000	93,436	16,000	4,000	20,000	113,436
2021	**39,249**	**52,831**	**2,000**	**94,080**	**16,000**	**4,000**	**20,000**	**114,080**

Source: URS, 2002.

2.7.1 PASSENGERS

Forecasts of peak hour enplanements are used to determine the future demand for facilities primarily used by departing passengers, such as ticket counters and departure lounges. The forecasts of peak hour deplanements will be used to assess the demand for facilities used by arriving passengers, such as baggage claim facilities. Likewise, the forecasts of total peak hour passengers will be used to determine the future demand for facilities used by passengers arriving and departing at the same time. These facilities include all general circulation areas, rest rooms, concessions, rental car counters, and terminal curb.

A review of the historical passenger levels at EYW revealed that the monthly distribution of enplanements and deplanement is essentially the same. Therefore, for the purpose of this study it will be assumed that peak month enplanement and peak month deplanement percentages will be the same.

From 1996 to 2000, the peak month for passenger enplanements has averaged 11 percent of annual passenger enplanements. On the basis of the March 2001 flight schedule listed in the Official Airline Guide, the peak hour for enplanements and deplanements averaged 17 percent of daily passengers. Using these peaking factors, a forecast of peak hour passenger enplanements was developed and is shown in Table 2.13. The peak hour for enplanements occurs in the early morning between 5:45 am and 6:45 am. The peak hour for deplanements occurs in the late morning between 11:45 am and 12:45 pm.

TABLE 2.13
PEAKING FORECASTS – PASSENGER ENPLANEMENTS
Key West International Airport
Master Plan Update

Year	Annual Passenger Enplanements	Peak Month Passenger Enplanements (11 Percent)	Average Day Peak Month Enplanements (30 days)	Peak Hour Enplanements (17 percent)
2001	262,761	28,904	964	164
2006	307,314	33,805	1,127	192
2011	347,698	38,247	1,275	217
2016	393,388	43,273	1,443	246
2021	445,083	48,960	1,632	278

Source: URS, 2002.

2.7.2 AIRCRAFT OPERATIONS

An analysis of aircraft operations from air traffic control tower logs for 1997 through 2001 revealed that the peak month typically occurs in March and accounts for 11 percent of annual aircraft operations. With respect to hourly peaking, air traffic control tower logs for the week of March 11, 2001, and the week of June 10, 2001, were obtained and analyzed to determine the peak hour. The results of this analysis indicated that the peak hour represented approximately 13 percent of daily operations. However, a review of actual peak hour traffic count for the week on March 11, 2001, indicated that hourly counts as high as 53 operations were recorded. To better match the peaks observed and to account for the extreme peak that the airfield experiences during Fantasy Fest and other busy periods a peak hour percentage of 15 percent was used to calculate peak hour forecast as shown on Table 2.14.

TABLE 2.14
PEAKING FORECASTS – AIRCRAFT OPERATIONS
Key West International Airport
Master Plan Update

Year	Annual Aircraft Operations	Peak Month Aircraft Operations (11 Percent)	Average Day Peak Month Operations (30 Days)	Peak Hour Operations (15 Percent)
2001	95,038	10,455	349	53
2006	97,662	10,743	359	54
2011	102,129	11,235	375	57
2016	108,885	11,978	400	60
2021	114,080	12,549	419	63

Source: URS, 2002.

SECTION 3
DEMAND/CAPACITY ANALYSIS AND FACILITY REQUIREMENTS

3.1 INTRODUCTION

In the previous section, forecasts of aviation demand were presented for Key West International Airport (EYW) through the year 2017. These forecasts included projections of annual passenger enplanements, aircraft operations, based aircraft, aircraft fleet mix, and peaking characteristics for both passenger enplanements and aircraft operations. Using this information, the capability of specific components of the airport system such as: the airfield, surrounding airspace, terminal facilities, general aviation facilities and ground access, is evaluated to determine if they are able to accommodate forecasted levels of demand without incurring significant delays or an unacceptable decrease in service levels.

The capacities of the various airport components are identified and described in this section. These capacities are then compared to forecasted levels of demand to determine if deficiencies presently exist, or are expected to occur in future years. If deficiencies are identified, a determination of the approximate size and timing of new facilities is made. The requirements for new facilities needed to accommodate projected demand in a safe and efficient manner are also presented in this section. Section 4 examines alternative methods of providing the required facilities identified in this section.

3.2 AIRFIELD

3.2.1 DEMAND/CAPACITY ANALYSIS

The methodology used for analyzing airfield capacity is described in FAA Advisory Circular 150/5060-5, entitled "Airport Capacity and Delay." The methodology describes how to measure an airfield's hourly capacity and its annual capacity which is referred to as annual service volume.

Hourly capacity is used to assess the airfield's ability to accommodate peak hour operations. Hourly capacity is defined as the maximum number of aircraft operations that can be accommodated by the airfield system in one hour.

Annual service volume (ASV) is used to assess the adequacy of the airfield design, including the number and orientation of runways. ASV is defined as a reasonable estimate of an airport's annual capacity. As the number of annual operations increases and approaches the airport's ASV, the average delay incurred by each operation increases. When annual operations are equal to the ASV, average delay to each operation is approximately one to four minutes depending upon the mix of aircraft using the airport. When the number of annual operations exceeds the ASV, moderate to severe congestion will occur.

A calculation of the airfield's hourly capacity and annual service volume depends upon a number of factors including the following:

- Meteorological Conditions - The percentage of time that visibility or cloud cover are below certain minimums.

- Aircraft Mix - The percentage of operations that are conducted by certain categories of aircraft.
- Runway Use - The percentage of time that each runway is used.
- Percent Touch-and-Go - The percent of aircraft operations that are touch-and-go's.
- Percent Arrivals - The percent of arrivals in relation to departures during peak hours.
- Exit Taxiway Locations - The number and locations of exit taxiways for landing aircraft.

3.2.1.1 Meteorological Conditions

Meteorological conditions have a significant effect upon runway use, which, in turn, affects an airfield's capacity. During Visual Meteorological Conditions (VMC), runway use is usually determined by the direction of the prevailing winds. During Instrument Meteorological Conditions (IMC), runway use is dictated by the type and availability of instrument approach procedures.

Illustrations of predominant wind conditions during VMC, IMC, and all-weather conditions were previously presented in Section 1 - Airport Inventory. That data, and consultation with air traffic control personnel, indicated that Runway 9 is the most commonly used runway end during both VMC and IMC conditions. It is estimated that the airport operates under VMC conditions 99.2 percent of the time and IMC conditions the remaining 0.8 percent of the time.

3.2.1.2 Aircraft Mix

Variations in aircraft approach speeds and landing distances affect runway occupancy times, which, in turn, affect airfield capacity. Table 3.1 summarizes representative aircraft types found in each aircraft classification. On the basis of historical activity, it is estimated that Class C aircraft comprise 35 percent of operations. The remaining operations are conducted by aircraft in Class A and Class B. The aircraft breakdowns were obtained from the Key West International Airport 2000 Noise Contour Update Report. The percentage of operations conducted by each class is expected to remain fairly constant throughout the planning period.

TABLE 3.1
TYPICAL AIRCRAFT MIX
Key West International Airport
Master Plan Update

Class	Aircraft Type	
Class A:	Small Single-Engine (Gross Weight 12,500 pounds or less)	
Examples:	– Cessna 172/182	– Mooney 201
	– Beech, Bonanza	– Piper Cherokee/Warrior
Class B:	Small, Twin-Engine (Gross weight 12,500 pounds or less)	
Examples:	– Beech Baron	– Mitsubishi MU-2
	– Cessna 402	– Piper Navajo
	– Rockwell Shrike	– Cessna Citation I
	– Beechcraft 99	– Beech King Air
Class C:	Large Aircraft (Gross Weight 12,500 pounds to 300,000 pounds)	
Examples:	– Douglas DC-9	– Beech 1900
	– Boeing 727	– Saab 340
	– Boeing 737	– Aerospatiale ATR 42/72
	– Dash-8	– Embraer 135/145
	– CRJ-200	– Embraer Brasilia
Class D:	Large Aircraft (Gross Weight more than 300,000 pounds)	
Examples:	– Boeing 767	– Airbus A-300/A-310
	– Boeing 777	– Douglas DC-8-60/70

Source: URS, 2002.

3.2.1.3 Runway Use

As indicated in Section 1 - Airport Inventory, the airport has one runway, which is Runway 9/27. Consultation with air traffic control personnel indicated that the use of the runway end is approximately 95 percent east-flow and 5 percent west-flow. This is primarily due to prevailing wind conditions, but is also affected, to a lesser extent, by the presence of NAF Key West just east of the airport. Due to noise abatement considerations and the easier coordination of operations between the two airfields when operating in east flow, there is a desire to maintain a east flow operation to the greatest extent possible.

3.2.1.4 Touch-and-Go Operations

A touch-and-go operation occurs when an aircraft lands and takes off without making a full stop. This is usually done for the purpose of practicing landings. Touch-and-go operations do not occupy the runway as long as a full-stop landing or a departure. Therefore, an airfield with a high number of touch-and-go operations can normally accommodate a greater number of operations. On the basis of consultation with airport management, touch-and-go activity at EYW is estimated to equal less than 10 percent of total operations.

3.2.1.5 Percentage Arrivals

The percentage of aircraft operations that are arrivals has an important influence on a runway's hourly capacity. For example, a runway used exclusively for arrivals will have a different capacity than a runway used exclusively for departures or a runway used for a mixture of arrivals and departures. In general, the higher the percentage of arrivals, the lower the hourly capacity of a runway. Arrivals were assumed to comprise consistently 50 percent of peak hour operations at EYW.

3.2.1.6 Exit Taxiway Locations

Exit taxiways affect airfield capacity because their location along a runway influences runway occupancy times for aircraft. The longer an aircraft remains on a runway, the lower the capacity of the runway. When exit taxiways are properly located, landing aircraft can quickly exit the runway, thereby increasing the runway's capacity. Runway 9/27 has two exit taxiways on the south side of the runway to minimize runway occupancy time.

3.2.2 CAPACITY ANALYSIS RESULTS

The capacity of the airfield was calculated on both an hourly and annual basis using the methodologies specified in FAA Advisory Circular 150/5060-5. The results of these analyses are presented in the following paragraphs.

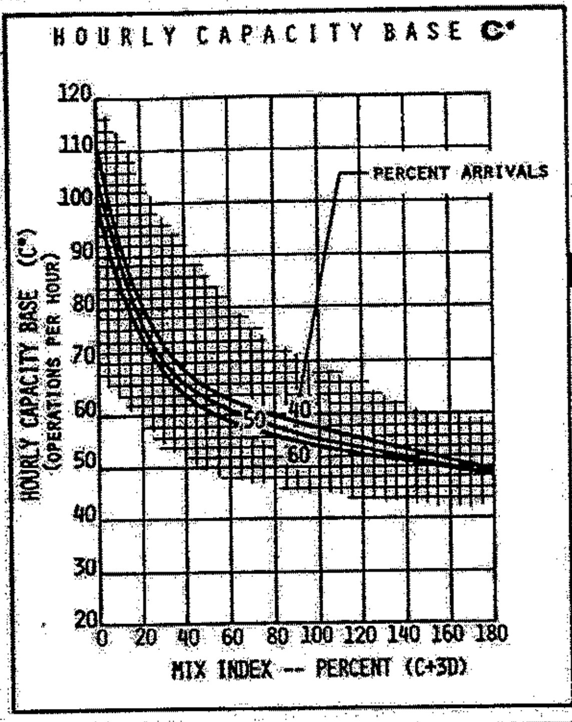
3.2.2.1 Hourly Capacity

Hourly capacity values were determined using the following equation:

$$\text{Hourly capacity of the runway component} = C * T * E$$

C is the raw capacity number provided by the advisory circular figures. The appropriate figures for VMC and IMC conditions single runway airfield, such as EYW, are depicted in Figure 3.1. T is the touch and go factor. The touch and go factor is also obtained from the advisory circular by determining the percentage of touch and go operations during VMC. E is the exit factor. The exit factor is also obtained from the advisory circular by determining the number and location of exit taxiways on the runway.

Using the data presented in Section 3.2 and the graphs in Figure 3.1, it was determined that the airfield's hourly capacity during VMC is 65 operations (68 * 1.04 * 0.93). The airfield's hourly capacity during IMC is 51 operations (56 * 1.0 * 0.92). As indicated in Table 3.2, the unconstrained forecast of peak hour operations will not exceed the VMC hourly capacity of the airfield during the planning period.



TOUCH & GO FACTOR T

Percent Touch & Go	Mix Index--Percent(C+3D)	TOUCH & GO FACTOR T
0	0 to 180	1.00
1 to 10	0 to 70	1.04
11 to 20	0 to 70	1.10
21 to 30	0 to 40	1.20
31 to 40	0 to 10	1.31
41 to 50	0 to 10	1.40

C* x T x E = Hourly Capacity

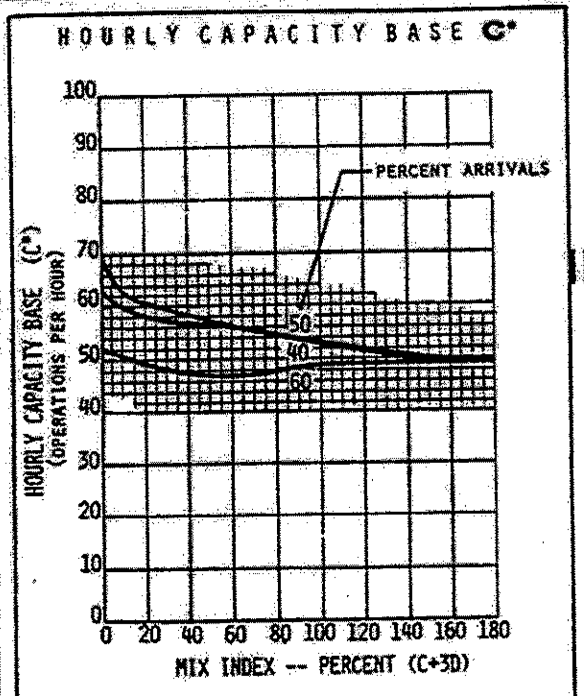
EXIT FACTOR E

To determine Exit Factor E:

1. Determine exit range for appropriate mix index from table below
2. For arrival runways, determine the average number of exits(N) which are: (a) within appropriate exit range, and (b) separated by at least 750 feet
3. If N is 4 or more, Exit Factor = 1.00
4. If N is less than 4, determine Exit Factor from table below for appropriate mix index and percent arrivals

Mix Index--Percent(C+3D)	Exit Range (Feet from threshold)	EXIT FACTOR E: 40% Arrivals N=0	N=1	N=2 or 3	50% Arrivals N=0	N=1	N=2 or 3	60% Arrivals N=0	N=1	N=2 or 3
0 to 20	2000 to 4000	0.72	0.87	0.94	0.70	0.86	0.94	0.67	0.84	0.92
21 to 50	3000 to 5500	0.79	0.86	0.94	0.76	0.84	0.93	0.72	0.81	0.90
51 to 80	3500 to 6500	0.79	0.86	0.92	0.76	0.83	0.91	0.73	0.81	0.90
81 to 120	5000 to 7000	0.82	0.89	0.93	0.80	0.88	0.94	0.77	0.86	0.93
121 to 180	5500 to 7500	0.86	0.94	0.98	0.82	0.91	0.96	0.79	0.91	0.97

FIGURE 3-3. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NOS.: 1,54 FOR VFR CONDITIONS.



TOUCH & GO FACTOR T

T = 1.00

C* x T x E = Hourly Capacity

EXIT FACTOR E

To determine Exit Factor E:

1. Determine exit range for appropriate mix index from table below
2. For arrival runways, determine the average number of exits(N) which are: (a) within appropriate exit range, and (b) separated by at least 750 feet
3. If N is 4 or more, Exit Factor = 1.00
4. If N is less than 4, determine Exit Factor from table below for appropriate mix index and percent arrivals

Mix Index--Percent(C+3D) 2-43,2-50	Exit Range (Feet from threshold)	EXIT FACTOR E: 40% Arrivals N=0	N=1	N=2 or 3	50% Arrivals N=0	N=1	N=2 or 3	60% Arrivals N=0	N=1	N=2 or 3
0 to 20	2000 to 4000	0.81	0.91	0.96	0.83	0.93	0.99	0.82	1.00	1.00
21 to 50	3000 to 5500	0.79	0.86	0.92	0.77	0.85	0.92	0.89	0.98	1.00
51 to 80	3500 to 6500	0.81	0.87	0.93	0.77	0.83	0.91	0.90	0.98	1.00
81 to 120	5000 to 7000	0.83	0.89	0.94	0.80	0.86	0.92	0.83	0.91	0.97
121 to 180	5500 to 7500	0.86	0.94	0.98	0.83	0.91	0.96	0.79	0.89	0.95

FIGURE 3-43. HOURLY CAPACITY OF RUNWAY-USE DIAGRAM NOS. 1, 54 FOR IFR CONDITIONS.

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Key West International Airport
Master Plan Update

HOURLY AIRFIELD CAPACITY GRAPHS

FIGURE: 3.1

TABLE 3.2
HOURLY AIRFIELD CAPACITY
Key West International Airport
Master Plan Update

Year	VMC Hourly Capacity	IMC Hourly Capacity	Unconstrained Forecast Peak Hour Operations
2001	65	51	53
2006	65	51	54
2011	65	51	57
2016	65	51	60
2021	65	51	63

Source: URS, 2002.

Although the airfield's hourly capacity during IMC is less than the forecasted peak hour operations this is not a constraint because peak hour operations would be lower during IMC. Furthermore, IMC occurs a very small amount of time and is more usually temporary in nature (i.e., a passing thunderstorm) than at other locations. Consequently, hour capacity of the airfield will be adequate to accommodate projected demand during the study period.

3.2.2.2 Annual Capacity

An airfield's ASV is calculated by determining the following three items:

- The weighted hourly capacity - C,
- The daily demand ratio - D, and
- The hourly demand ratio - H.

The weighted hourly capacity is calculated via a formula that considers the hourly capacity values during VMC and IMC as well as the percentage of time that each weather condition occurs. The weighted hourly capacity of EYW was calculated to be 64 operations (the details of this calculation are presented in Appendix A). This value is nearly the same as the VMC value because VMC weather condition occurs 99.2 percent of the time.

The daily demand ratio is calculated by dividing the annual number of aircraft operations by the average daily operations during the peak month. This calculation (92,591 / 295) results in a daily demand factor of 314 for EYW. This value falls within the range of 300 to 320 that is listed in the FAA advisory circular as being typical daily demand factors for an airport with a mix index between 21 and 50. As presented in Section 3.2.1.2, EYW has a mix index of 35 percent of operations. Multiplying this mix index by the percentage of time that VMC and IMC occur at the airport results in a composite index of 35 percent.

The hourly demand ratio is calculated by dividing the average daily operations during the peak month by the average peak hour operations during the peak month. This calculation (294 / 36) results in a daily demand factor of 8.25 for EYW. This ratio is lower than the range of 10 to 13 that is listed in the FAA advisory circular as being typical hourly demand ratios for an airport with a mix index between 21 and 50. This ratio is lower at EYW because EYW has a very high peak hour that is approximately 12 percent of average daily operations during the peak month. EYW's peak hour is nearly twice as high as the 7 to 9 percent that is indicated as being typical in the advisory circular.

Using the values derived, the ASV for EYW is presented in the following equation:

$$\text{ASV} = \text{C}\ (64) * \text{D}\ (314) * \text{H}\ (8.25) = 165{,}792 \text{ operations}$$

The result of the equation is an ASV that is low for a single-runway airfield. A typical ASV range for single-runway airfield is approximately 195,000 to 230,000. Nonetheless, the projected ASV still exceeds the projected annual aircraft operations throughout the study period by a wide margin. Therefore, it can be concluded that the existing airfield has adequate capacity to accommodate projected annual aircraft operations.

3.2.3 REQUIREMENTS

3.2.3.1 Design Criteria

To properly and consistently plan future facilities, design criteria must be identified and applied. Airport design criteria are specified by the airport reference code that consists of two components. The first component is the aircraft approach category. This component is related to the approach speed of aircraft and provides information on the operational capabilities of aircraft using the airport. The second component is the airplane design group. This component is related to the wingspan of the aircraft and provides information regarding the physical characteristics of aircraft using the airport. Table 3.3 provides a listing of the approach categories and design groups.

TABLE 3.3
AIRPORT DESIGN CRITERIA
Key West International Airport
Master Plan Update

Aircraft Approach Category	
Category	Approach Speed
A	Less the 91 Knots
B	91 to 120 Knots
C	121 to 140 Knots
D	141 to 165 Knots
E	166 Knots or Greater

Airplane Design Group	
Group	Wing Span
I	Up to 48 Feet
II	49 to 78 Feet
III	79 to 117 Feet
IV	118 to 170 Feet
V	171 to 213 Feet
VI	214 Feet or Greater

Source: FAA Advisory Circular 150/5300-13, *Airport Design*, September 29,1989.

Aircraft Approach Category

A review of aircraft presently using, and forecasted to use, EYW reveals that aircraft in approach category C (i.e., approach speed of 121 knots or more but less than 141 knots) regularly use the airport. This includes the Canadair CRJ-700 and certain business jets.

The Canadair CRJ-700 regional jet began use of EYW in October 2002. This aircraft falls within approach category C (i.e., approach speed of more than 121 knots but less than 141 knots). Therefore, approach category C will be used to plan future airfield facilities associated with Runway 9/27.

Airplane Design Group

Although larger aircraft, such as the B-737 use EYW on an occasional basis, the DASH-8 is anticipated to be the largest aircraft in terms of wingspan to regularly use EYW in the future.[1] This aircraft has a wingspan of 90 feet, which places it within design group III (i.e., a wingspan of 79 feet up to but not including 118 feet). Therefore, future facilities associated with Runway 9/27 will be designed to meet group III standards. It should be noted that all of the regional jets anticipated to use EYW have wingspans less than that of the DASH-8. Thus, even though the fleet mix at the airport is changing, the airplane design group is not expected to increase from its current category.

[1] The FAA defines regular use as a minimum of 500 operations by a single type of aircraft.

Airport Reference Code

The airport reference code is determined by combining the aircraft approach category letter with the airplane design group number. Consequently, the airport reference code for EYW is C-III. It should be noted that this is a significant increase from the airport reference code listed in the last master plan which was a B-III. This increase is primarily related to the introduction of regional jet aircraft service at EYW.

3.2.3.2 Runway Safety Areas

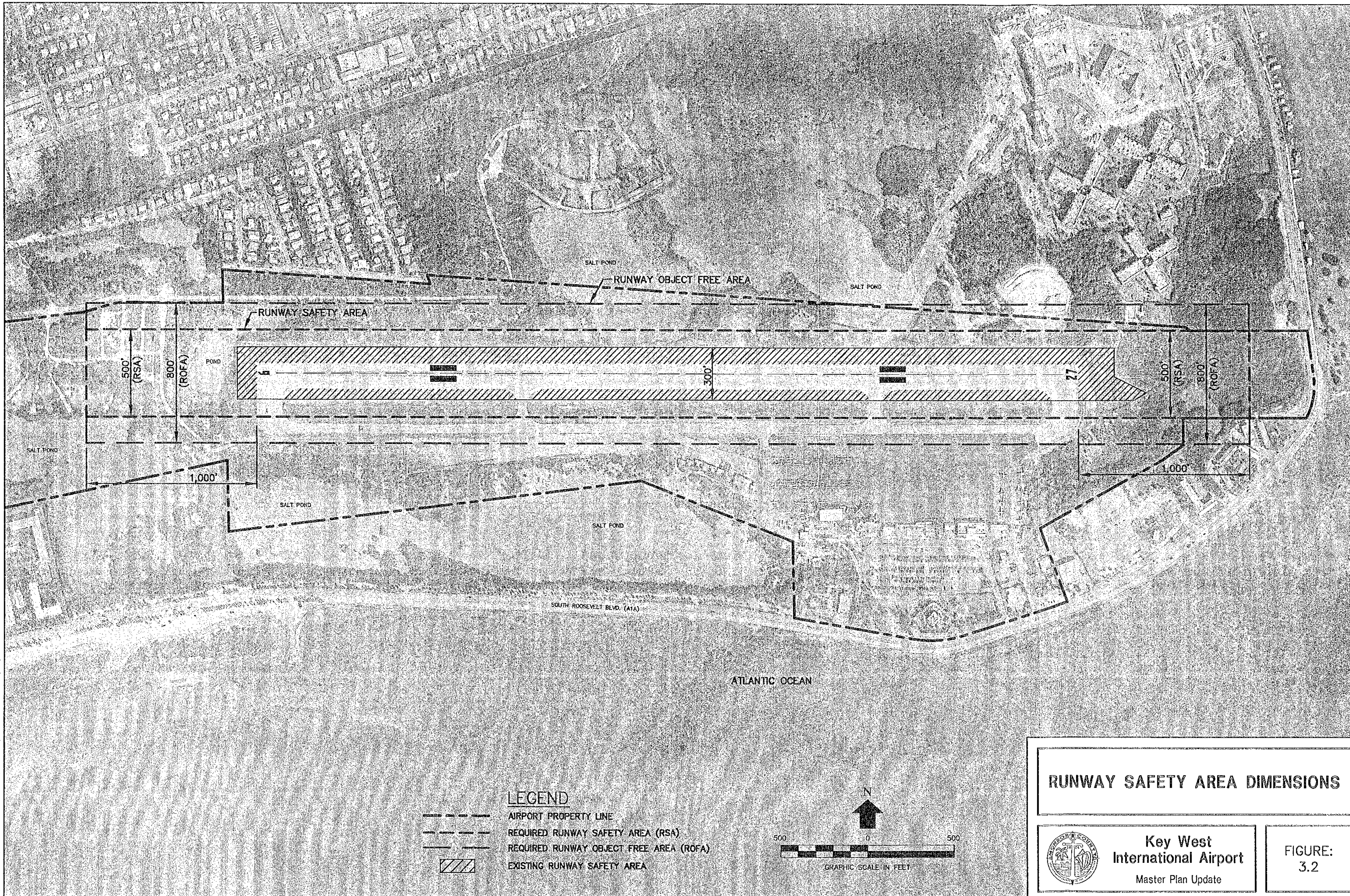
Runway safety areas (RSA) are defined by the FAA as "surfaces surrounding a runway that are prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway." Runway safety areas consist of a relatively flat graded area that is free of objects and vegetation that could damage aircraft. According to FAA guidance, the runway safety area should be capable, under dry conditions, of supporting aircraft rescue and fire fighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft.

It should be noted that the FAA standard for the runway safety area at EYW previously had a width of 300 feet and a length of 600 feet beyond each end of the runway. However, the actual amount of runway safety area that meets FAA standards beyond each end of the runway is as little as approximately 100 feet at the west end of the runway and an irregular shaped area of approximately 200 feet at the east end of the runway. The width of the area that meets FAA standards is approximately 300 feet.

With the introduction of regional jet service at EYW in September 2002, the dimensional standards of the runway safety area increased to a width of 500 feet and a length of 1,000 feet beyond each end of the runway. As was previously the case, the actual amount of safety area provided beyond the end of the runway falls far short of the standard. Furthermore, due to the greater width of the safety area (i.e., 500 feet instead of 300 feet), there is a portion of the runway safety area north of the runway that also does not meet standards because of mangroves and salt ponds.

Figure 3.2 provides an illustration of the dimensions of the runway safety area in relation to surrounding salt ponds, mangroves and other features. The portion of the runway safety area that extends beyond the west end of the runway encompasses wetlands, a pond, mangroves and the East Martello Battery Bunker, which dates back to World War II. The portion of the safety area that extends beyond the east end of the runway encompasses wetlands, salt ponds and mangroves. In addition, a portion of the runway safety area north of the runway encompasses wetlands, salt ponds and mangroves.

The requirements for bringing the runway safety area into conformance with FAA standards will be addressed in the airfield alternatives portion of this report contained in Section 4 – Alternatives.



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3.2.3.3 Runway Object Free Area

In addition to the runway safety area, an object free area (OFA) is also defined around a runway in order to enhance the safety of aircraft operations. The OFA is cleared of all objects except those that are related to navigational aids and aircraft ground maneuvering. However, unlike the runway safety area, there is no physical component to the object free area. The OFA for runways serving aircraft in approach categories C and D has a width of 800 feet and a length beyond the runway end of 1,000 feet. The existing OFA at EYW does not meet this standard. Requirements for bringing the OFA into conformance with FAA standards will be addressed in the airfield alternatives portion of this report contained in Section 4 – Alternatives.

3.2.3.4 Runway Separation Standards

Separation standards indicate the distance that various facilities such as taxiways, aprons and other operational areas must be located from runways. These standards ensure that aircraft can safely operate on both areas simultaneously without fear of collision. These standards also ensure that no part of an aircraft on a taxiway penetrates the runway safety area or obstacle free zone.

The runway-to-taxiway separation standard for a D-III runway with visibility minimums not lower than ¾ statute miles is 400 feet. The current separation between Runway 9/27 and Taxiway Alpha is 315 feet; 85 feet less than the requirement. However, the critical aircraft at EYW in terms of wingspan is the DASH-8 which has a wingspan of 90 feet. Application of the FAA's Airport Design computer program, Version 4.2 reveals that a runway centerline to taxiway centerline separation of 295 feet is allowed for a critical aircraft having a wingspan of 90 feet. Thus, the existing runway centerline to taxiway centerline exceeds this allowance by 20 feet. Therefore, a modification of FAA standards for the existing separation of 315 feet should be sought as part of the ALP approval process.

3.2.3.5 Number of Runways

The number of runways required at an airport depends upon factors such as wind coverage and operational capacity. Wind coverage indicates the percentage of time that crosswind components are below an acceptable velocity. The FAA recommends that an airport provide wind coverage of at least 95 percent. This means that the runway is able to accommodate aircraft operations that fall within their limits of crosswind performance 95 percent of the time. If an airport does not provide the recommended wind coverage, additional runways should be considered.

A review of wind data presented in Section 1 indicates that Runway 9/27 provides adequate wind coverage at a crosswind component of 16 knots during VMC and all-weather conditions but less than adequate wind coverage during IMC. While an additional runway is technically eligible under FAA standards, there is little need for an additional runway and site constraints preclude its consideration.

In addition to wind coverage, the required number of runways depends upon capacity needs. The results of the demand/capacity analysis indicate that the existing runway system will provide adequate capacity on an hourly and annual basis throughout the study period. Therefore, on the basis of both wind coverage and capacity requirements, the existing runway will be adequate to serve the future needs of the airport.

3.2.3.6 Runway Length

Runway length requirements at EYW were determined through a combination of methodologies including the following:

- FAA "Airport Design" computer program Version 4.2
- FAA Southern Region Guidance Letter RGL 01-2 dated August 10, 2001
- Takeoff Performance Tables for the CRJ200 and CRJ700 regional jets

These methodologies range from general guidance, in the case of the Airport Design program, to detailed site-specific data, in the case of Takeoff Performance Tables. Because EYW is an extremely constrained site, it was deemed appropriate to consider a variety of methodologies and to consider methodologies that are more detailed than would normally be considered in the context of a master plan update. Each of the methodologies and the results obtained from each are described in the following paragraphs.

Airport Design Computer Program, Version 4.2

The FAA's Airport Design computer program considers the following items:

- Airport elevation
- Mean daily maximum temperature of the hottest month
- Maximum difference in runway centerline elevation
- Length of haul for airplanes of more than 60,000 pounds
- Pavement conditions (wet or dry)

Information relevant to EYW for the above items was entered into the program. The results of the program are specified for aircraft of more than 60,000 pounds and aircraft of less than 60,000 pounds. The category of less than 60,000 pounds is further subdivided by the groups of aircraft and their gross takeoff weight.

Groups of aircraft are specified by using either 75 or 100 percent of the fleet. Table 3.4 lists some of the aircraft types that comprise 75 and 100 percent of the fleet. Gross takeoff weight is specified by using 60 percent or 90 percent of useful load.

TABLE 3.4
AIRCRAFT FLEET
Key West International Airport
Master Plan Update

Large aircraft less than 60,000 pounds that comprise 75 percent of the fleet include the following:

Manufacturer	Model
Gates Lear Jet	Lear Jet (20, 30 & 50 series)
Rockwell International	Sabreliner (40, 60, 75, & 80 series)
Cessna	Citation (II & III)
Dassault Brequet	Falcon (10, 20, & 50 series)
British Aerospace	HS-125 (400, 600, &b 700 series)
Israel Aircraft Ind.	1124 Westwind

Large aircraft less than 60,000 pounds that comprise 100 percent of the fleet include the aircraft listed above and the following:

Manufacturer	Model
Canadair	Challenger 601
Dassault Brequet	Falcon (900 series)
Grumman	Gulfstream (I-IV)
Lockhead	Jetstar

Source: URS, 2002.

The results of the runway length analysis using the Airport Design Program methodology are presented in Table 3.5. FAA criteria specify that the runway length requirements for an airport such as EYW be determined using the "75 percent fleet at 60 percent useful load" unless a critical aircraft having a greater requirement can be identified. As the table indicates, a runway length of 5,340 feet is required. For aircraft greater than 60,000 pounds, the required runway length is 5,400 feet based on a haul length of 700 miles. This haul length was selected because it is sufficient to reach Atlanta, which is currently the farthest destination from EYW.

TABLE 3.5
RUNWAY LENGTH ANALYSIS
Key West International Airport
Master Plan Update

Category	Recommended Runway Length (Feet)[1]
Aircraft of 60,000 Pounds or Less	
75% of these aircraft at:	
60% useful load	5,340
90% useful load	7,000
100% of these aircraft at:	
60% useful load	5,500
90% useful load	8,200
Aircraft more than 60,000 pounds[2]	5,400

Source: FAA Advisory Circular 150/5325-4A.
[1] Assumes wet runway conditions.
[2] Assumes a haul length of 700 miles.

FAA Southern Region Guidance Letter RGL 01-2, dated August 10, 2001

This methodology consists of a Microsoft Excel spreadsheet program that the FAA Southern Region recommends to supplement the information provided for business jets in the "Airport Design" program. It consists of data for a variety of business jets and allows the user to modify the base data to account for elevation, temperature and runway gradient at each airport. It should be noted that this methodology does not consider aircraft other than business jets. Consequently, this methodology can only be used to supplement the preceding methodology.

Three aircraft, the Citation X, the Learjet 60 and the Gulfstream IV, were selected and used in the analysis as being representative of the types of business jet aircraft that operate at EYW. Runway length requirements for these aircraft at 60 percent useful load range from 4,730 to 5,015. Runway length requirements for these aircraft at 100 percent useful load range from 5,900 feet to 6,300 feet. The FAA Southern Region guidance letter indicates that runway lengths are normally designed for 60 percent useful load unless justification for higher loads can be provided. Print outs from the spreadsheets for these three aircraft are provided in Appendix B – Runway Length Analysis.

Takeoff Performance Tables for CRJ200 and CRJ700 Series Regional Jets

Comair began operating the Canadair CRJ-200 aircraft to Orlando from EYW in September of 2002. In October 2002, Atlantic Southeast Airlines began operating the Canadair CRJ-700 to Atlanta from EYW. It was deemed appropriate to examine, in greater detail, the runway length requirements associated with these aircraft because they have significantly more demanding runway length requirements than the turboprop aircraft that have operated at the airport in recent years.

Aircraft manufacturers' airport compatibility manuals are typically used to ascertain the required runway length for operation by air carrier aircraft and regional jets. These manuals contain runway length curves that are simple to use. However, the runway length curves are somewhat broad and sometimes need to be supplemented with more detailed data for individual airlines and site-specific conditions. This is especially true at airports that have physical and/or environmental constraints such as EYW.

In order to obtain more detailed data for the CRJ-200 and CRJ-700, takeoff performance tables were obtained. These tables do not directly indicate runway length requirements. They indicate takeoff and landing weight limitations for a given temperature and multiple other factors on a specific runway at a specific airport. The advantage of using these tables is that they provide the same level of information used by the airlines for actual aircraft operations. The disadvantage of using these tables to determine runway length requirements is that they are a very cumbersome methodology. This is because each table is prepared for a specific runway length at a specific airport. Therefore, multiple tables are sometimes needed to determine a required runway length to operate an aircraft at a specific weight or to determine weight limitations at various runway lengths. Furthermore, the likely operating weight of the aircraft to each destination must be known.

URS consulted with the flight operation departments of Comair and Atlantic Southeast Airlines to determine the fuel loads necessary to operate regional jets to Orlando and Atlanta. This allowed